

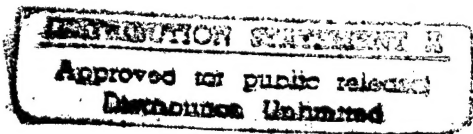
DATE: 3/20/97

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DISTRIBUTION STATEMENT A: Public release



Foreign Technologies Offer Opportunities for Saving

As a result of a review completed in March 1996, a number of foreign testing technologies have been identified which may answer some of the special needs of U.S. testers. Some are "high tech" advancements which are actually operational at foreign labs and ranges and for which no U.S. counterpart is yet in service. The review, sponsored by U.S. Army Test and Evaluation Command (TECOM), responded to guidance developed at annual TECOM Test Technology Symposia on international cooperation.

Both U.S. and foreign testing officials have discussed the benefits of standardizing and sharing test procedures and technologies among allied testing communities. As a result, some excellent opportunities for technology sharing have already been exploited, saving several millions of technology development dollars. TECOM management endorsed the concept, supporting further exploration of technology opportunity areas.

Opposing Arguments to Adopting Foreign Technologies

The concept of adopting foreign materiel and technology to satisfy U.S. military needs is not universally accepted. On the plus side is the opportunity to obtain an advanced test technology more quickly and at a reduced cost. On the minus side are two central points - the "not invented here (NIH)" syndrome (i.e. they can't do it as well as we can); and the "Buy American" philosophy, currently another hot debate in Congress. The NIH syndrome probably will always be with us. So, we must simply push through it where cost and time factors dictate shopping elsewhere-in this case, overseas.

The Buy American Act applies to selected commodities (propellers, anchor chains, ball bearings, etc.), and it is safe to assume that test technology is not of concern, at least at congressional level.

Standardization Is Not New to the Tester

The testing community has been especially attentive to international standardization calling for international cooperation in the development of testing technology at every opportunity. In several cases, adopting foreign testing procedures and instrumentation has saved us money. At Test Technology Symposium VII (July 1994), 19 cases of shared testing technologies were identified with an estimated \$5.3 million in savings or cost avoidances.

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Recognizing these successes and facing ever-tightening budgets, TECOM's Simulation and Technology Division directed a rigorous look at progress being made throughout the worldwide testing community with the express purpose of maximizing return on the technology investment. The Foreign Test Technology Application Review identified specific technology projects for which application of an existing foreign capability might obviate new U.S. initiatives with an estimated savings of about \$18 million.

Review Objectives

The study's four objectives were to identify foreign technologies/instrumentation having application to TECOM's mission; compare foreign items and technologies with current requirements in the TECOM Data Acquisition Program (TDAP) data base and determine degree to which TDAP shortfalls are satisfied; estimate potential cost benefits of acquiring foreign capability; and, develop a list (data base) for future reference and usage.

Testing technologies from nine nations were investigated (United Kingdom, Germany, France, The Netherlands, Sweden, Canada, Israel, Denmark, and Australia). Fifteen broad technology areas were looked at and wherever possible quantitative performance was recorded (e.g. power levels, frequencies, data rates, instrument accuracies). Those countries, and specific test centers with demonstrated capabilities, were listed in the review.

Rating Foreign Technologies

Information defining specific technical requirements was obtained from the TDAP data base and personal contacts with TECOM project officers and technology engineers. Companion data for relevant foreign technologies was obtained from various literature from the foreign test centers and from trip reports generated by U.S. technologists. A correlation rating, reflecting the degree to which the foreign capability met the TDAP shortfall, was assigned. Ratings were "good," "partial," "general," or "none."

"Good" meant that the foreign capability met or exceeded the U.S. need or was a great improvement over current methods. "Partial" meant that the foreign capability met some portion of the U.S. need, or there was missing information in the literature.

"General" meant that a foreign capability exists but did not satisfy the U.S. specifications. "None" meant that there was no foreign capability for the technology.

In some cases, the TDAP provides several levels of detailed numerical requirements for which there were no documented numbers on the companion foreign technology to enable comparison. For these cases, if the most significant of the needed specifications was present in the foreign equipment, a correlation rating of "good" was assigned. Some further verification of these will be required.

Table 1 from the report shows those nations with technologies having a good correlation with a U.S. need.

| <u>Country</u> | <u>Foreign Title</u> | <u>TDAP Title</u> |
|----------------|-----------------------------------|---|
| Canada | Low-Bit Rate Speech Encoding | Flight Range Data/Commo Security |
| Denmark | Weibel Tracking Radar | TSPI Collection (Radar) |
| France | High Capacity Data Transmission | Field Test Instrumentation Upgrade |
| Germany | Weibel Radar | Radar Measurement Capability for Ballis |
| Germany | Tire Tester | Temperature Testing of Tires |
| The NL | Surface Acoustic Wave | Inadequate Chemical Agent Detection/ |
| | Dewtection/Sampling | Quantification |
| The NL | Drive Line Test Bench | Autonomous Control for Test Vehicle |
| UK | Advanced Material Non-destructive | Advanced Techniques for Material Analysis |
| | Techniques | |
| UK | Rail evasive Target Track | Rail Mobile Target Range |
| UK | Fiber-optic Transducers | Fiber-optic Sensor Development |
| UK | Doppler/Ground Grid Projectile | Advanced Projectile Flight Imaging Capa |
| | Follower | |
| UK | Rail-mounted butt/evacuator | Fire Safety Test Enclosure |
| | system | |
| UK | Advanced IR tracking camera | Missile Tracking Through Trajectory Sim |
| UK/Germany | Hadland Camera | Ground Video Equipment |

Table 1. "Good Correlations"

Although the study identified a number of existing foreign testing capabilities which appear to satisfy U.S. testing needs, there needs also to be strategy to verify the technology and to obtain "hands-on" understanding of how it works. The strategy described in the report centers around selection of some U.S. development items for test at the foreign facility. Consideration of this approach will require special scheduling during the Army's development process via inclusion in Test and Evaluation Master Plan documents and coordination by the Test Integration Working Groups (TIWG's).

Some Examples

The complete review includes 58 technology shortfall areas for which a foreign capability may completely or partially satisfy a U.S. shortfall. Some examples from the review illustrate the process.

Robot/Autonomous Control of Vehicles

At U.S. Army Aberdeen Test Center (ATC), engineers continue to explore new ways to automate operations. A key function is to operate and test Army vehicles. Appropriately, there exists a TDAP project for autonomous control of test vehicles. Presently, test vehicles are controlled by human drivers with the attendant costs and safety concerns. ATC estimates driver labor costs at over \$2 million each year, and driver safety is always a concern.

Equally important is the fact that test control and repeatability are difficult as different drivers create different environments for the test item. In addressing the problem, TECOM has identified three "robotics-type" projects in TDAP for "autonomous control of test vehicles." These projects are estimated at about \$5 million over the next 5 years. The system will be applied to vehicle tests on the Munson, Perryman, and Churchville courses.

Advancements in robotics were also uncovered in the foreign test centers. The Huijbergen Test Center in the Netherlands currently is operating vehicles via a sophisticated robotics system called the "Drive Line Bench." TECOM representatives who have seen it were impressed. The Netherlands instrumentation offers a remote control system which has a true "robot" driver approach. The robot operates switches, accelerator, brakes, clutch, etc. "accelerating, turning, and stopping the vehicle as specified by a test scenario. Use of this technology may offset some of the planned development cost for U.S. vehicle robotics.

Mobile Missile Instrumentation Suite

The missile testing centers at U.S. Army White Sands Missile Range (WSMR) and U.S. Army Redstone Technical Test Center need highly sophisticated instrumentation and control devices which can be readily moved to different geographic locations. The suite must be autonomous, rugged, and capable of handling digital data, pulse code modulation telemetry, global positioning system (GPS), and international range instrumentation group (IRIG) timing data. This ambitious project is divided into three subprojects to meet the need of both agencies.

WSMR's realtime data display will provide a portable display of 3-D objects, including "virtual objects," and will generate a realtime test report. The center also proposes a transportable range augmentation and control system (TRACS), a portable suite to handle all range data including off-range tri-service testing requirements.

At Redstone, the flight test data acquisition system will provide two portable systems to record the various telemetry, IRIG, GPS, and bus data for small missile and rocket tests at their ranges. This portable system is a lightweight set of recording instruments which "ride along" on the test vehicle. It is intended for tests of smaller missiles (TOW, ITOW, IBAS (Bradley), JAVELIN, Hellfire).

The Foreign Technology Review identified a capability in Israel that could be at least a partial solution to this missile testing shortfall. Israel's Shdema range has a "mobile test range," capable of receiving and recording missile data from several sources. This mobile suite was effectively used during the real war operations of Desert Storm, recording data from Patriot missile flights.

In summary, a number of existing foreign testing technologies should be given further consideration for meeting U.S. needs. The Foreign Technology Data Base developed for the recent study is available through TECOM's Simulation and Technology Division. This data base will be expanded as more information on foreign test technologies is obtained.

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